

# IMPACT ASSESSMENT FOR RESERVOIR FISHERIES AND BIOLOGICAL ASSESSMENTS UNDERWAY FOR PROGRAMMATIC ENDANGERED SPECIES CONSULTATION

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**REFERENCE:** *Proceedings of the 1999 Georgia Water Resources Conference*, held March 30-31, 1999, at the University of Georgia. Kathryn J. Hatcher, Editor, Institute of Ecology, The University of Georgia, Athens, Georgia.

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**Abstract.** This paper describes a joint effort between the U.S. Army Corps of Engineers (Corps), U.S. Fish and Wildlife Service (USFWS), and CH2M HILL to assess the impacts of water allocation on the reservoir fisheries of the Alabama-Coosa-Tallapoosa (ACT) and Apalachicola-Chattahoochee-Flint (ACF) River Basins. We also present the approach being implemented by the Corps, in coordination with USFWS, to prepare the Biological Assessment of Federal threatened and endangered species with potential to be affected by the water allocations in each basin. These analyses are being conducted to support preparation of the environmental impact statement (EIS) for each basin.

## INTRODUCTION

The states of Alabama, Florida, and Georgia are implementing interstate water compacts for the ACT and ACF River Basins. The compacts direct interstate Commissions created for each basin to develop an allocation formula for equitably apportioning surface waters among the states, while protecting water quality, ecology, and biodiversity as provided for under Federal laws. The Corps (Mobile District) is the lead agency for preparing the EISs for the water allocations as required by the National Environmental Policy Act (NEPA). The EISs will assist an appointed Federal Commissioner in deciding whether to concur or not concur with the allocation formulas to be negotiated by the State Commissioners to the Compact Commissions.

To complete NEPA review within the schedule required by the compacts, the Corps and a team of cooperating Federal agencies issued the draft EISs in October 1998. The EISs evaluate the effects of water allocation on a broad range of resources, including biological resources, at a programmatic level of review. Because the allocation formulas are not yet available, the draft EISs evaluate a range of alternative flow conditions using different combinations of projected water supply demands and reservoir operations and releases. Once

the States reach agreement on the allocation formulas, more detailed evaluations will be presented in the final EISs.

## RESERVOIR FISHERIES ASSESSMENT

The ACT basin has over 170,000 acres of reservoir habitat associated with 16 reservoirs on mainstem rivers. Sixteen reservoirs on the mainstems of ACF rivers provide the vast majority of lacustrine habitat in that basin. Six dams in the ACT basin and five in the ACF basin are Federally owned by the Corps. It is assumed that operational changes at some of these reservoirs may be required to implement the allocation formulas in each basin.

Mainstem reservoirs in both basins support significant populations of popular sport fishes, including: striped and white bass; largemouth and spotted bass; sunfishes and crappie; and channel, blue, and flathead catfishes. Substantial variations in reservoir water levels could adversely affect such fisheries, depending on their duration, magnitude, and time of year.

This assessment focused on 15 reservoirs, 10 in the ACT basin and five in the ACF basin, for which current operations result in substantial variations in water levels over the course of the year (Table 1). Other reservoirs were excluded from the assessment because most are operated more nearly in run-of-river modes, which tend to minimize pronounced variations in water levels.

## Methods

USFWS developed a performance measure to be used as an index to assess relative impacts of different flow scenarios on reservoir fisheries in the ACT and ACF basins. The performance measure is based on the premise that greater departure of reservoir levels from optimum levels for critical guilds of fishes (e.g., littoral spawning) results in greater impacts to their habitats. The performance measure uses HEC-5 modeling output of daily reservoir elevations over the 55-year period of record and "acceptability levels" of

**Table 1. ACT and ACF Basin Reservoirs Included in Fisheries Assessment.**

ACT Basin		ACF Basin
Carters	Jordan	Lanier*
Allatoona*	Harris*	West Point*
Weiss*	Martin	Harding
H. Neely Henry	"Bob" Woodruff	Walter F. George*
Logan Martin	"Bill" Dannelly	Seminole

\* Reservoirs also included in drought period analysis.

reservoir elevations for critical guilds as identified for each reservoir by regional fisheries experts in a Delphi survey (Ryder et al., 1995). It also incorporates day-to-day reservoir level stability over critical spawning and rearing periods as a weighting factor, with stable or rising levels having a positive effect and falling levels having a negative effect on fish habitat.

Three flow conditions (high, moderate, and low) were evaluated and compared to the no action flow alternative for the EISs. These flow scenarios correspond with reservoir operations modes needed to support minimum instream flows during critical low-flow periods, and were selected to establish a range of flow conditions that would likely bracket the flows associated with negotiated allocation formulas. Each flow scenario was modeled in HEC-5 using 1995, 2020, and 2050 projected water demands.

Performance measure scores were computed for each year in the period of record using the algorithm developed by USFWS. Scores range between 0 for least acceptable and 1.0 for most acceptable reservoir level habitat conditions. Alternatives were compared using frequency distributions of the annual scores.

Because extended droughts could exert the most severe impacts to reservoir fisheries from prolonged drawdowns covering multiple spawning and rearing seasons, drought periods also were evaluated for six reservoirs (Table 1). Two historical periods with the most widespread and sustained drought conditions were selected for each basin.

## Results

Median (50<sup>th</sup> percentile) performance measure scores were examined as those reflecting average reservoir levels for the entire period of record. Figure 1 depicts the median performance measure scores for Martin Lake on the Tallapoosa River in the ACT basin as an example. All 10 reservoirs in the ACT basin showed little or no variation in performance scores between the three consumptive demands within each flow scenario (i.e., 1995, 2020, 2050). The greatest differences were observed among the alternative flow scenarios.

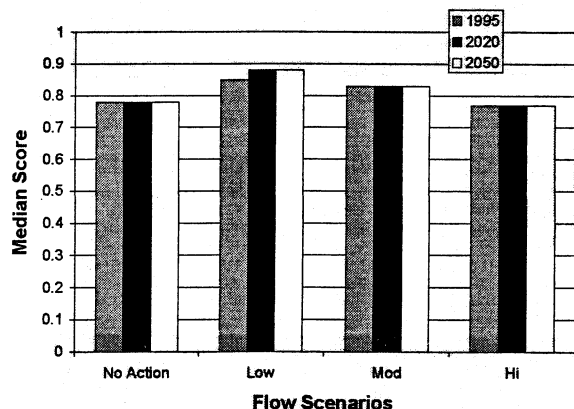
For Allatoona, Weiss, H. Neely Henry, Logan Martin, and Harris Lakes in the ACT basin, and Lanier, West Point, and

Walter F. George Lakes in the ACF basin, the no action alternative showed a greater potential for reservoir fisheries impacts (i.e., lowest scores) than the high, moderate, and low flow scenarios. However, because the range of flow scenarios was intended to bracket any foreseeable allocation formula, reservoir fisheries impacts under the no action alternative would be expected to fall within the range of impacts represented by the action flow scenarios. The principal factor contributing to lower scores under no action was the simulation of more pronounced seasonal drawdowns than under the low and moderate flow scenarios. HEC-5 modeling of the high flow scenario eliminated seasonal drawdowns for flood control. Further, hydropower peaking operations could not be reasonably modeled for the action scenarios. Peaking operations, which were accounted for under no action, typically result in daily or weekly water level fluctuations, which also would contribute to lower performance measure scores.

Because of the differences in modeling assumptions masking seasonal and daily variations under the three action scenarios, performance measure scores are not directly comparable between the action scenarios and the no action alternative. The range of potential impacts represented by the high, moderate, and low flow scenarios would be wider, and likely bracket the no action impacts, if seasonal drawdowns and hydropower peaking operations were incorporated into the respective models.

Among the three action flow scenarios in the ACT basin, Lake Allatoona in the headwaters of the basin and Martin Lake achieved the highest performance measure scores (i.e., lowest potential for impacts) under the low flow scenario. For these reservoirs, the lowest reservoir releases would maintain the most stable water levels on an annual basis. Conversely, Carters, Weiss, and Logan Martin Lakes achieved the highest performance scores under the high flow scenario. Woodruff, H. Neely Henry, Harris, and Dannelly Lakes showed little or no sensitivity across the action flow scenarios.

In the ACF basin, Lake Lanier and West Point Lake achieved the highest performance measure scores under the low flow scenario. These larger headwater reservoirs would control most of the flow allocation crossing the Georgia-Alabama state line. Hence, the low flow scenario, which requires the lowest reservoir releases, would maintain the most stable reservoir levels on an annual basis. Based on the range of scores observed across the action scenarios for Lake Lanier (0.10) and West Point Lake (0.08), these two reservoirs show the greatest potential for adverse impacts to reservoir fisheries habitat under alternative flow scenarios. The three downstream reservoirs in the ACF basin exhibited variable responses. However, the narrower ranges of scores among scenarios suggest a lower potential for adverse effects



**Figure 1. Median performance measure scores for Martin Lake.**

due to water level fluctuations.

Under drought conditions, all six reservoirs evaluated showed the highest reservoir fisheries performance measure scores under the low flow scenario. This result is consistent with the expectation that lower reservoir releases during droughts would help to sustain higher and more stable water levels.

While the USFWS performance measure provides a means of comparing relative impacts between scenarios, it does not distinguish potential impacts resulting from sustained drawdowns covering multiple spawning seasons. Examination of daily plots of reservoir water elevations over drought periods indicates that, for headwater storage reservoirs, such impacts could be severe. For the drought period 1954-1960, the high flow scenario would have substantially impacted four consecutive spawning and rearing seasons for largemouth bass, spotted bass, white bass, and crappie in Lake Lanier (CH2M HILL, 1998).

Based on the sum of rankings of performance measure scores for individual reservoirs under each alternative, the low flow scenario showed the highest acceptability for maintaining reservoir fisheries habitat in both the ACT and ACF basins.

## Discussion

Overall, the performance measure for reservoir fisheries exhibited a relatively narrow range of variation for distinguishing potential impacts between the high, moderate, and low flow scenarios for individual reservoirs.

For reservoirs where scores for the no action alternative do not deviate strongly from the action flow scenarios, there actually may be very little difference in potential reservoir fisheries impacts between the no action alternative and action flow scenarios. These reservoirs show little variation in

seasonal and daily water levels regardless of the differences in modeling assumptions relative to drawdowns and hydropower.

More pronounced negative deviation of the no action scores from the action flow scenarios might be an indication that reservoir fisheries impacts associated with the action flow scenarios could be greater than suggested by the scores. The modeling assumptions used in the action flow scenarios appear to mask daily and seasonal variations in water levels that would be expected to lower their performance measure scores. These findings suggest that, with the draft EIS modeling assumptions, the reservoir fisheries performance measure may be most useful in identifying reservoirs with the greatest potential for significant adverse effects under action flow scenarios.

## BIOLOGICAL ASSESSMENT FOR PROTECTED SPECIES

The Federal endangered species act (ESA) requires the preparation of a Biological Assessment (BA) when a major action has the potential to affect protected species or their critical habitat. Preliminary findings in the draft EISs for the ACF and ACT basins indicated that the proposed water allocation formula could affect the habitat of listed species. Therefore, the Corps has agreed to begin informal consultation with the USFWS under the provisions of Section 7 of the ESA.

## Objective

This study will provide USFWS with information needed to determine whether the proposed water allocation formula would result in potential impacts on Federal protected species. The information will be provided in a BA and will be used by the USFWS to prepare a final response letter or Biological Opinion that will be included in the final EIS. The BA will be prepared at a programmatic level commensurate with the analysis completed for the draft EISs. The Federal Commissioner will use the findings on protected species when making the decision to concur or non-concur with the proposed water allocation formula.

## Methods

This project will be conducted in two discrete steps. The first step is to prepare a geographic information system (GIS) database in ARC/VIEW 3.0 identifying the locations of the Federally-listed species that should be addressed in the BA. This database and documentation will be used to screen the larger number of listed species that have been documented in the basins down to the species most likely to be affected by changes in water management.

Preliminary studies by the USFWS and their contractors provided supplemental site-specific information on the presence of protected species in specific reaches of the two basins. These studies, combined with the protected species inventory prepared by USFWS as part of the Comprehensive Study (Ziewitz, 1997), will be used to develop the database. Specific data layers in the database will include political boundaries, overall basin boundaries and major subbasins, streams, dams and reservoirs. Species distribution maps will be prepared to identify the overall range of the individual species. Historical and current ranges will be identified. Site-specific species locality data will be protected to minimize the potential for disturbance.

Based on the distribution maps and supporting documentation, an interim report will be prepared to document those species that are most susceptible to "may affect" determinations as a result of the changes in water management required to implement the final water allocation formula.

The second step will be completed after the final allocation formulas are developed by the States and will focus on the evaluation of direct and indirect impacts of the allocation formula. This analysis will be summarized in the BA and incorporated into the final EIS. The impacts analysis will focus on the potential impacts associated with water management changes that may occur at existing Corps projects in the basin that may be required to implement the formula. Other activities outside the influence of the Corps operations may also affect protect species or their habitat, such as future population growth, land use changes, unrelated water quality changes, or flow changes not related to Corps operations (e.g., groundwater pumping for agricultural irrigation purposes, new non-Corps operated reservoirs, etc.). These activities will be identified and reviewed with the USFWS to determine the responsible agency or organization that may be required to continue consultation with the USFWS.

The assessment of potential effects will identify which species have potential to be impacted and the river reach where the impacts may occur. Cumulative effects of the allocation formula on protected species also will be addressed. Measures that may be implemented to avoid or minimize impacts will be discussed at a programmatic level.

### Summary

The proposed BA will be completed to assist the USFWS in making a determination of potential affect of the final water allocation formula on protected species in the ACF and ACT river basins. Results of the studies will be used to support the Federal Commissioner's decision to concur or non-concur with the water allocation formula developed by

the States. Information developed for the BA can be used to support future Section 7 consultation actions that may be required to implement site specific (project specific) operations to the meet the water allocation formula.

### ACKNOWLEDGMENTS

We thank Mike Eubanks with the Corps for valuable review comments. Jerry Scheller with CH2M HILL was instrumental in completing the analysis of the HEC-5 model output.

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